

The lesser families of Mexican terrestrial molluscs*

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Abstract: Forty-two families of terrestrial molluscs inhabit Mexico with approx. 1,178 species and subspecies. The most diverse families are the Urocoptidae (265 species), Spiraxidae (246), Bulimulidae (140), Helicinidae (72), Polygyridae (65), Xanthonychidae (58), Humboldtianidae (49), and Pupillidae (47). The 34 medium and small families comprise about 81% of the total number of families; however, their species total only 236 or 20% of the Mexican species. When looking at their distribution, we noticed that, in general, families cover large areas, but while some species are also found in the United States and Central America, the majority seems to be endemic to Mexico. However, our knowledge of the distribution of terrestrial molluscs throughout Mexico may be incomplete because of a lack of systematic collecting in many regions, particularly in the States of Aguascalientes and Tlaxcala.

Key words: Mexico, land snails, distributions

This work is based on data collected from literature records with additional data from unpublished sources (Naranjo-García and Fahy, unpubl. data). Small families (Table 1) with fewer than 30 species were analyzed (a total of 34), and eight more families, the most diverse families with more than 30 species (indicated by *), are not included in this work. The records were mapped to view species distribution within each family. Only representative maps are included. A total of 236 species and subspecies constitute the 34 families treated in this paper:

CERESIDAE

The Ceresidae is a family distributed in Mexico and South America (Thompson 1980) and is found in subtropical and tropical environments. In Mexico, the Ceresidae is mainly distributed in the east, with two records in the west. It has eight species in the genera *Ceres* Gray, 1856 (3), *Linidiella* Jousseaume, 1889 (2), and *Proserpinella* Bland, 1865 (3).

Ceres colina (Duclos, 1834) and *Ceres salleana* Gray, 1856 are from the northern and the central parts of the State of Veracruz (Martens 1890-1901, Pilsbry 1891, Solem 1957, Thompson 1980). *Ceres nelsoni* Dall, 1898 is found in the southern half of the State of Tamaulipas (Solem 1954, Thompson 1980, Correa-Sandoval 1999, 2002, 2003) and the

eastern part of the State of San Luis Potosí (Thompson 1980, Correa-Sandoval 1997, 1998, 1999).

Linidiella citrina Thompson, 1987 is from the central part of the State of Veracruz (Comalapa) (Thompson 1987). *Linidiella sulfureus* Thompson, 1967 is known only from a single locality in the northern part of the State of Chiapas (Solosuchiapa) (Thompson 1967a).

Proserpinella berendti Bland, 1865 is from the west central part of the State of Veracruz (Mirador) (Bland 1865, Martens 1890-1901). *Proserpinella hanna* Dall, 1926 is from Tres Marias Islands (María Madre Island) of the State of Nayarit (Dall 1926, Naranjo-García 1994). *Proserpinella edentula* Naranjo-García, 1994 is from the Natural Reserve on the central coast of the State of Jalisco (Estación de Biología Chamela) (Naranjo-García 1994).

CYCLOPHORIDAE

The family Cyclophoridae ranges in the Western Hemisphere from Mexico to the Antilles and South America (De la Torre and Bartsch 1942). In the Eastern Hemisphere, it is in Indochina, Japan, Philippines, India, Indonesia, Melanesia, Africa, Madagascar, and Australia (Boss 1982). Thompson (2008: 74) recognizes the proper name of the family to be Neocyclotidae Kobelt and Moellendorff, 1897.

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Table 1. A list of Mexican terrestrial mollusc families (classified as in Vaughn 1989) with number of species and subspecies.

Family	Species number	Family	Species number
1. *Helicinidae	72	22. Megomphicidae	1
2. Ceresiidae	8	23. Strophidiidae	4
3. Cyclophoridae	23	24. Haplotrematidae	4
4. Megalomastomidae	4	25. Punctidae	7
5. Diplommatinidae	2	26. Helicodiscidae	6
6. Annulariidae	8	27. Charopidae	2
7. Truncatellidae	6	28. Discidae	2
8. Veronicellidae	2	29. Oreohellicidae	7
9. Ellobiidae	9	30. Succineidae	24
10. Carychiidae	2	31. Sagdidae	1
11. Achatinellidae	2	32. Gastrodontidae	5
12. Cochlicopidae	1	33. Euconulidae	17
13. *Pupillidae	47	34. Vitrinidae	3
14. Vallonidae	5	35. Zonitidae	18
15. Strobilopsidae	7	36. *Polygyridae	65
16. *Bulimulidae (= Orthalicidae)	140	37. Thysanophoridae	15
17. Amphibulimidae	2	38. *Humboldtianidae	49
18. *Urocoptidae	265	39. *Xanthonychidae	58
19. Ferussaciidae	4	40. Helminthoglyptidae	10
20. Subulinidae	21	41. Arionidae	1
21. *Spiraxidae	246	42. Philomycidae	3

* Family not treated in this work.

The Cyclophoridae are distributed across four regions of Mexico. *Amphicyclotus* Crosse and Fischer, 1879 is found mainly in the southern most region, with some records in the central part of Veracruz; *Aperostoma* Troschel, 1847 is distributed along the Gulf of Mexico from the mid-part of the State of Tamaulipas to southern Veracruz; *Dicrista* Thompson, 1969 is found in western Mexico from below the central part of the State of Sinaloa to the State of Guerrero; and *Neocyclotus* Fischer and Crosse, 1886 is found in southern Mexico, in southern Veracruz, Oaxaca, southern Tabasco, Chiapas, and the entire Peninsula of Yucatán. While the distribution of *Dicrista* does not overlap the other genera, the distribution of *Amphicyclotus* generally overlaps that of *Neocyclotus* in the State of Chiapas, where most of the range of *Amphicyclotus* occurs. Twenty-three Mexican species of Cyclophoridae have been described in the genera *Amphicyclotus* (6), *Aperostoma* (3), *Dicrista* (7), *Neocyclotus* (6), and *Xenocyclotus* Thompson, 1969 (1).

Amphicyclotus boucardi (Pfeiffer, 1856) is from the center of the State of Veracruz (Cordoba) (Martens 1890-1901, Díaz de León 1912, Thompson 1966). *Amphicyclotus paulsonorum* Thompson, 1969 is found in the south coastal area of the State of Chiapas (Thompson 1969). *Amphicyclotus maleri*

Crosse and Fischer, 1883 is found in the south central part of the State of Tabasco (Poaná Mountains) (Pilsbry 1893, Solem 1956) and in the southern part of the State of Oaxaca (Santa Efigenia, Tehuantepec) (Martens 1890-1901, Díaz de León 1912). *Amphicyclotus megaplans* Morrison, 1955 is found in the western part of the State of Chiapas (Ocozocoautla) (Morrison 1955, Thompson 1969), (El Ocote forest) (Bequaert 1957). *Amphicyclotus texturatus spiralis* Thompson, 1969 is found in the southern corner of the State of Chiapas (Thompson 1969). *Aperostoma mexicanum salleanum* (Martens, 1865) is found throughout the State of Veracruz (Papantla) (Martens 1890-1901, Díaz de León 1912, Baker 1922, 1928, Thompson 1969, Solem 1956) and in the northern part of the State of Oaxaca (Tuxtutepec, Playa Vicente) (Solem 1956, Chevallier 1965). *Aperostoma palmeri* (Bartsch and Morrison, 1942) is from the mid-region of the State of Tamaulipas (Bartsch and Morrison 1942, Solem 1954, 1956, Correa-Sandoval 1999, 2002, 2003), the southeastern part of the State of San Luis Potosí (Solem 1956, Thompson 1969, Correa-Sandoval 1997, 1998, 2003), the northern part of the State of Hidalgo, and the north central region of the State of Veracruz (Solem 1956). *Aperostoma walkeri* Baker, 1928 is found in the northern part of the States of Puebla and Veracruz (Baker 1928, Bartsch and Morrison 1942, Morrison 1955, Solem 1956, Correa-Sandoval 2000, 2003).

Dicrista cooperi (Tryon, 1863) is from the southern region of the State of Sinaloa (Tryon 1863, Bartsch and Morrison 1942, Thompson 1969) and on the coast of the States of Jalisco, Colima, and Guerrero (Bartsch and Morrison 1942, Thompson 1969). It has also been found in the State of Oaxaca by Thompson (1969) who did not provide a precise locality.

The following species are known only from their type locality: *Dicrista damianensis* (Solem, 1956) in the southern part of the State of Michoacán (near San Pedro Damian Naranjestilla) (Solem 1956, Thompson 1969); *Dicrista flavescens* Thompson, 1969 near Mazatlan in the State of Guerrero (Thompson 1969); *Dicrista indentata* Thompson, 1969 in the State of Michoacán (near San Vicente), *Dicrista liobasis* Thompson, 1969 from the State of Jalisco (near Pihuamo). *Dicrista rugosa* Thompson, 1969 is found in the central region of the State of Colima and *Xenocyclotus patulus* Thompson, 1969 from the State of Colima (Tamala) (Thompson 1969). *Dicrista petersi petersi* (Solem, 1956) is from the State of Michoacán (La Placita = Sulatillo) (Solem 1956, Thompson 1969).

Amphicyclotus palenquensis (Pilsbry, 1935) is from south central Veracruz (Solem 1956) and north and northeastern parts of the State of Chiapas (Pilsbry 1935, Bequaert 1957).

Neocyclotus dysoni dysoni (Pfeiffer, 1851) is found in the central part of the State of Veracruz (Martens 1890-1901, Díaz de León 1912, Baker 1922, Chevallier 1965), in the

central and southern portions of the State of Oaxaca (Martens 1890-1901, Díaz de León 1912), in the southern part of the State of Tabasco (Martens 1890-1901), in the northern part of the State of Campeche (Thompson 1967b), very possibly all around the State of Yucatan, since various localities have been recorded from that state (Martens 1890-1901, Pilsbry 1891, Branson and McCoy 1965), and also occurs in the center of the State of Quintana Roo (Xiatil) (Thompson 1967b). *Neocyclotus dysoni ambiguus* (Martens, 1890) is found in the south and south center of the State of Veracruz and at the north and center of the State of Chiapas (Martens 1890-1901, Bartsch and Morrison 1942, Solem 1956, Thompson 1969). It is also found at the east central part of the State of Oaxaca (Rio Grande) and in the southern part of the State of Tabasco (Mountains of Poaná, Teapa) (Solem 1956, Thompson 1969). *Neocyclotus dysoni aureum* (Bartsch and Morrison, 1942) is found in the southern part of the State of Oaxaca (Panistlahuaca, Gamboa) (Bartsch and Morrison 1942, Solem 1956), in the western part of the State of Campeche (Branson and McCoy 1963), and in the northeast (Laguna Ocotla) and west center (El Sumidero, Tuxtla Gutierrez) of the State of Chiapas (Bequaert 1957). *Neocyclotus dysoni berendti* (Pfeiffer, 1861) is from the center and southern part of the State of Veracruz (Baker 1922, Solem 1956, Naranjo-García and Polaco 1997) and is widely distributed in the Peninsula of Yucatan (Martens 1890-1901, Baker 1928, Bequaert and Clench 1933, 1936, 1938, Richards 1937, Bartsch and Morrison 1942, Harry 1950, Branson and McCoy 1963, 1965, Rehder 1966, Thompson 1967b, Gómez-Espinosa 1999). *Neocyclotus dysoni cookei* (Bartsch and Morrison, 1942) is found in the central part of the State of Campeche (Thompson 1967b). The species *Neocyclotus simplicostus* Thompson, 1969 is found in the southeastern corner of the State of Chiapas (Thompson 1969).

MEGALOMASTOMIDAE

The family Megalomastomidae, exclusively American (Boss 1982), is distributed from southern Mexico to Guatemala and in Cuba, Hispaniola, Puerto Rico, and the Virgin Islands (De la Torre and Bartsch 1942). The Mexican distribution occurs in two separate regions: at the so-called "Los Tuxtlas" region, and south central Veracruz and eastern Chiapas in the Selva Lacandona. In Mexico it is represented by four species in the genus *Tomocyclus* Crosse and Fischer, 1872.

Tomocyclus guatemalensis (Pfeiffer, 1851) and *Tomocyclus lunae* Bartsch, 1945 are from the southern part of the State of Veracruz (Martens 1890-1901, Bartsch 1945, Thompson 1963, Chevallier 1965, Naranjo-García and Polaco 1997) and *Tomocyclus gealei* Crosse and Fischer, 1872 and *Tomocyclus simulacrum* (Morelet, 1849) are from the eastern part of the

State of Chiapas (Lagos de Montebello) (Martens 1890-1901, Bequaert 1957, Thompson 1963, Chevallier 1965, Naranjo-García *et al.*, in press).

DIPLOMMATINIDAE

The family Diplomatinae is found in Europe, from southeast Asia to Australia, Melanesia, and Micronesia, and Mexico, Central America, and the Antilles (Boss 1982). It has a somewhat subtropical and tropical distribution.

Two Mexican species in the genus *Adelopoma* Doering, 1884 have been recognized. *Adelopoma stollii* Martens, 1890 is located in the southern part of the States of Tamaulipas and San Luis Potosí (Correa-Sandoval 1998, 1999, 2003). The other species is undescribed from the center of the State of Tamaulipas (Ciudad Victoria, Sierra Victoria) and reported by Correa-Sandoval (2002).

ANNULARIIDAE

The family Annulariidae is considered by Burch (1962) to have a tropical and subtropical distribution. It is well represented in the Antilles (Pilsbry 1948) and ranges from Florida, Mexico, Central America, northern South America (Bolivia), and the Antilles (Henderson and Bartsch 1921, Boss 1982, Watters 2006). The Annulariidae inhabit southern Mexico (Fig. 1). The genus *Choanopoma* Pfeiffer, 1848 occurs on the entire Peninsula of Yucatan, Chiapas and eastern Oaxaca. *Chondropoma* Pfeiffer, 1847 is apparently confined to two separate regions: one in the central part of Veracruz and the second in the southern part of the State of Tabasco. In Mexico the Annulariidae has eight species in two genera *Choanopoma* (6) and *Chondropoma* (2).

Choanopoma andrewsae (Ancy, 1886) is found at Cozumel Island (Richards 1937), as well as the northeast, center, and southwest parts of the State of Quintana Roo (Rehder 1966), north and north-northwest portions of the State of Campeche, and the south and southeastern portions of the State of Yucatan (Thompson 1967b). *Choanopoma gaigei* Bequaert and Clench, 1931 is found in the entire eastern part of the State of Campeche, in the mid western (Mérida; Chichen Itza), and southern parts of the State of Yucatan (Bequaert and Clench 1931), and in the northern, center, and southwestern portions of the State of Quintana Roo (Thompson 1967b, Gómez-Espinosa 1999). *Choanopoma largillierii* (Pfeiffer, 1846) is from the north to the central part of the State of Campeche (Bequaert and Clench 1936, Solem 1961, Branson and McCoy 1965, Thompson 1967b). In the State of Yucatan, it is distributed from the center (Chichen Itza) towards the west (Pilsbry 1891, Bequaert and Clench 1933, 1936, 1938,



Figure 1. Distribution of the genera *Choanopoma* and *Chondropoma* in Mexico.

Richards 1937, Harry 1950, Branson and McCoy 1963, 1965, Chevallier 1965, Thompson 1967b). It is also found in the northern, center, and southwestern regions of the State of Quintana Roo (Solem 1961, Rehder 1966, Thompson 1967b). The distribution of *Choanopoma martensianum* (Pilsbry, 1900) is the south center of the State of Tabasco (Pilsbry 1900, Thompson 1957, Rangel-Ruiz and Gamboa 2001).

Choanopoma sumichrasti Crosse and Fischer, 1874 is from about the center of the State of Chiapas (Tuxtla Gutierrez, Chiapa de Corzo) (Fischer and Crosse 1870-1902, Bequaert 1957, Solem 1961, Chevallier 1965) and from the coastal area of the State of Oaxaca (Tehuantepec) (Chevallier 1965). According to Thompson (2008) in his recent revision of the entire molluscan fauna of Mexico and Central America, the correct name of *Choanopoma sumichrasti* is *Annularia sumichrasti* (Crosse and Fischer, 1874). *Choanopoma terecostatum* Thompson, 1966 is found in the western part of the State of Chiapas (Ocozacoautla) (Thompson 1966) and at the south center of the State of Tabasco (Parque Estatal La Sierra) (Rangel-Ruiz and Gamboa 2001).

Chondropoma rubicundum (Morelet, 1849) is from the northern end of the State of Chiapas (Laguna Ocotol) (Bequaert 1957, Solem 1961) and in the contiguous State of Tabasco at the south central mountains of Poana (Pilsbry 1893, Solem 1961). *Chondropoma cordovanum* (Pfeiffer, 1856) is found in the center of the State of Veracruz (Cordoba) (Martens 1890-1901, Baker 1928, Solem 1961).

TRUNCATELLIDAE

The family Truncatellidae has a worldwide (Boss 1982) tropical and subtropical distribution (Burch 1962). Because snails of this family are amphibious intertidal inhabitants, the Truncatellidae in the western part of Mexico is distributed about the Peninsula of Baja California and all along the Caribbean coast from the State of Tamaulipas to the State of Quintana Roo.

The family in Mexico has six species in the genus *Truncatella* Risso, 1826.

Truncatella bairdiana C. B. Adams, 1852 is from the center coastal area of the State of Guerrero (Acapulco) (Martens 1890-1901). *Truncatella bilabiata* Pfeiffer, 1840 is on the Isla del Carmen, State of Campeche (Martens 1890-1900) and in pools south of Progreso, State of Yucatan (Bequaert and Clench 1936, Harry 1950). *Truncatella caribaensis* Sowerby in Reeve, 1842 is found along the coast of the Gulf of Mexico from the State of Tamaulipas to the State of Quintana Roo (Bequaert and Clench 1933, García-Cubas 1963, 1968, 1981, Andrews 1981, Flores-Andolais *et al.* 1988, García-Cubas and Reguero 1990, Reguero *et al.* 1991). *Truncatella californica* Pfeiffer, 1857 is from both coasts of the Peninsula of Baja California to the upper Gulf of California and on various nearby islands (Baker 1902, Lowe 1913, Pilsbry 1927, Keen 1971, Smith *et al.* 1990). *Truncatella guadalupensis* Pilsbry, 1901 is from Guadalupe Island, State of Baja California

(Pilsbry 1901, Smith *et al.* 1990). *Truncatella pulchella* Pfeiffer, 1839 is from Dzilam de Bravo, State of Yucatan and Mujeres Island, State of Quintana Roo (Parodiz 1977).

VERONICELLIDAE

Veronicellidae is found in tropical and subtropical areas of America, Africa, Asia, and Oceania (Boss 1982). It has two apparently native Mexican species that belong to the genus *Leidyula* Baker, 1925: *Leidyula floridana* (Leidy and Binney in Binney, 1851) and *Leidyula moreleti* (Fischer, 1871). *Leidyula floridana* is recorded from the central region of the State of Nuevo Leon. In contrast, *L. moreleti* mainly inhabits the east coastal region of Mexico, except for two localities: one in the southern part of the State of Nayarit and the other in the southern part in the State of Oaxaca (Naranjo-García *et al.* 2007).

ELLOBIIDAE

Ellobiidae lives in the intertidal zone and has a worldwide distribution: the Red Sea, Pacific and Atlantic Oceans, near Australia, the Philippines, Indo-Pacific, and Mediterranean Sea (Thiele 1935). It is found on both coasts of Mexico.

There are nine Mexican species in four genera: *Marinula* King and Broderip, 1832 (1), *Melampus* Montfort, 1810 (4),

Pedipes Bruguière, 1792 (3), and *Saruia* H. and A. Adams, 1855 (1).

The species *Marinula rhoadsi* Pilsbry, 1910, *Melampus monseylei* Berry, 1964, *Melampus olivaceus* Carpenter, 1857, *Pedipes liratus* Binney, 1860, *Pedipes unisulcatus* Cooper, 1866, and *Saruia mexicana* (Berry, 1964) are endemic; all inhabit the northern part of the Gulf of California (Keen 1971, Gonzalez 1993). *Melampus tabogensis* C. B. Adams, 1852 is from the central coastal part of the State of Jalisco (Barra de Navidad) (Keen 1971). *Melampus coffeus* (Linnaeus, 1758) and *Pedipes mirabilis* (Muhlfeld, 1816) are found along the Gulf of Mexico coasts (Abbott 1974).

CARYCHIIDAE

The family Carychiidae inhabits northern Europe, Asia, and North America (Pilsbry 1948, Boss 1982). It is found in the eastern part of Mexico from the State of Nuevo Leon to the State of Tabasco (Contreras-Arquieta 1995, Pilsbry 1891, 1903, Baker 1930, Correa-Sandoval 1993, 1998, 1999, 2002, 2003, Rangel-Ruiz and Gamboa 2001).

Two subspecies of *Carychium* Müller, 1774 exist in Mexico. *Carychium exile exile* H. C. Lea, 1842 is from the State of Nuevo Leon, without a specific locality (Contreras-Arquieta 1995).

Carychium exile mexicanum Pilsbry, 1891 (Fig. 2) is mainly in the east coastal States of Mexico: Tamaulipas



Figure 2. Distribution of the species *Carychium exile mexicanum* in Mexico.

(Correa-Sandoval 1999, 2002), Nuevo Leon (Pilsbry 1903, Correa-Sandoval 1993, 1999), San Luis Potosi (Correa-Sandoval 1998, 2003), Puebla (Baker 1930, Correa-Sandoval 1999), Veracruz (Pilsbry 1891, 1903, Correa-Sandoval 1999), and Tabasco (Rangel-Ruiz and Gamboa 2001).

ACHATINELLIDAE

The general family distribution is on the Pacific Islands and contiguous areas (Boss 1982). Consequently, the family had been found on the Mexican Pacific islands.

There are only two Mexican species in the genus *Tornatellides* Pilsbry, 1910: *Tornatellides mexicana* Dall, 1926 is on Socorro Island and *Tornatellides clarionensis* Dall, 1926 is from Clarion Island. Both islands are in the Revillagigedo Archipelago, State of Colima (Dall 1926).

COCHLICOPIDAE

The family Cochlicopidae is of Palearctic origin and the genus *Cochlicopa* Férussac, 1821 in Risso, 1826 is considered Holarctic (Pilsbry 1948, Boss 1982) and contains a single Mexican species: *Cochlicopa lubrica* (Müller, 1774) (Fig. 3) that inhabits the north central states (northwestern Chihuahua, southern Nuevo Leon, and Durango) (Pilsbry 1953a, Bequaert and Miller 1973, Contreras-Arquieta 1995, Correa-Sandoval 2003).

VALLONIDAE

The Vallonidae is a Holarctic family (Bequaert and Miller 1973, Boss 1982) and is distributed mainly in northern Mexico, with a record in the center of Mexico.

Five species, in two genera are recorded from Mexico: *Erectidens* Pilsbry, 1953 (1) and *Vallonia* Risso, 1826 (4) (Fig. 3).

Erectidens trichalus Pilsbry, 1953 is found in the west central part of the State of Nuevo Leon (Rio Maurisco) (Pilsbry 1953b). *Vallonia cyclophorella* Sterki, 1892 is found at Sierra San Pedro Martir, State of Baja California (Smith *et al.* 1990). *Vallonia excentrica* Sterki, 1893 is from the center of Mexico (Cuernavaca) (Pilsbry 1948). *Vallonia gracilicosta* Reinhardt, 1883 is in Nuevo Leon, with no specific locality specified (Correa-Sandoval 2003). *Vallonia perspectiva* Sterki, 1892 is from along Rio Piedras Verdes, State of Chihuahua (Pilsbry 1953a). Bequaert and Miller (1973) record that it reaches northern Mexico in Sonora and Chihuahua, without giving precise localities.

STROBILOPSIDAE

The family Strobilopsidae is widely distributed from Eastern North America (Quebec, Ontario, and Manitoba, latitude 52°N) to South America (Venezuela and eastern Brazil), in the Galapagos Islands, Japan, Korea, China, and Philippines (Pilsbry 1948, Boss 1982). Pilsbry (1948) thought



Figure 3. Distribution of the species *Cochlicopa lubrica* and three species of *Vallonia* in Mexico.

that Asia might be the center of evolution of the genus *Strobilops*, due to the great diversity of the genus in that territory. The family is distributed mainly in eastern Mexico from the north (States of Tamaulipas, Nuevo Leon, San Luis Potosi, and Puebla) to the south in Veracruz (Los Tuxtlas). In western Mexico, it is found in the southern part of the State of Baja California and in the Tres Marias Islands (State of Nayarit).

The family Strobilopsidae is represented in Mexico by seven species in the genus *Strobilops* Pilsbry, 1893. *Strobilops aenea mexicana* Pilsbry, 1927 is from the west center of the State of Nuevo Leon (Pilsbry 1953a), eastern part of the State of San Luis Potosi (Correa-Sandoval 1998, 2003), northern part of the State of Puebla (Baker 1930), and in the west central part of the State of Veracruz (Baker 1930, Correa-Sandoval 1999).

Strobilops californica Miller and Christensen, 1980 is from the southern tip of the State of Baja California Sur (Miller and Christensen 1980, Smith *et al.* 1990). *Strobilops hubbardi* (Brown, 1861) is from the mid-southern part of the State of Tamaulipas (Correa-Sandoval 1999, 2002) and from the eastern part of the State of San Luis Potosi (Correa-Sandoval 1998, 2003). *Strobilops labyrinthica* (Say, 1817) is from the west central part of the State of Veracruz (Martens 1890-1901, Diaz de León 1912). *Strobilops sinaloa* Morrison, 1953 is known only from vegetables confiscated at the United States boarder coming from the State of Sinaloa (Morrison 1953); its type locality needs to be located. *Strobilops strebeli* (Pfeiffer, 1861) is present at the Tres Marias Islands (Socorro Island), State of Nayarit (Dall 1926).

Strobilops veracruzensis Pilsbry, 1927 is from the center of the State of Veracruz (Veracruz) (Clench and Turner 1962).

AMPHIBULIMIDAE

The family Amphibulimidae is mainly distributed in South America and the Antilles with one genus in South Africa (Boss 1982). There are two Mexican species in the genus *Simpulopsis* Beck, 1837. *Simpulopsis aenea* Pfeiffer, 1861 is found in the center of the State of Oaxaca (La Parada) (Martens 1890-1901) and *Simpulopsis simula* (Morelet, 1851) in the northeastern part of the State of Chiapas (Laguna Ocotol to El Censo) (Bequaert 1957). The genus *Simpulopsis* belongs to the family Orthalicidae according with Thompson (2008).

FERUSSACIIDAE

The family Ferussaciidae is worldwide in tropical and subtropical habitats (Boss 1982). It is mainly in eastern Mexico with some records in the western States of Sonora and Nayarit.

It has four Mexican species, in three genera: *Ceciloides* Férussac, 1814 (2), *Coelostele* Crosse, 1876, and *Karolus* de Folin in de Folin and Perrier, 1870. *Ceciloides* section *Caecilianopsis* Pilsbry, 1907 has a tropical American distribution; *Coelostele* has species in Asia, northern Africa, southern Spain, and eastern Mexico (Thiele 1935).

Ceciloides (*Caecilianopsis*) *jod* Pilsbry, 1907 has been recorded only from Tampico, in the southern part of the State of Tamaulipas (Hinkley 1907, Pilsbry 1907). There is an undescribed species of *Ceciloides* from Alamos, Sonora (Naranjo-García 1991).

Coelostele tampicoensis (Pilsbry, 1907) is recorded from Tampico, in the southern part of the State of Tamaulipas (Clench and Turner 1962). Thompson (2008: 254) places *Coelostele* in the family Carychiidae and mentions that the genus is located in India, southern Arabia, Egypt, Syria, and southern Spain. Being *Coelostele tampicoensis* a single species in the Americas, it is most likely an introduction (Thompson 2008).

Karolus consobrinus primus (De Folin, 1870) is the most widely distributed Mexican species of this family. It is found in the center and southeastern part of the State of Sonora (Pilsbry 1953a, Naranjo-García 1991), in the northern part of the State of Sinaloa (Pilsbry 1953a), and in northwestern Mexico. In eastern Mexico it is recorded from the eastern part of the States of Nuevo León (Correa-Sandoval 1997), in the mid-southern part of the State of Tamaulipas (Harry 1950, Correa-Sandoval 2002, 2003), in the eastern part of the State of San Luis Potosi (Correa-Sandoval 1998), in northern and center parts of the State of Veracruz (Fischer and Crosse 1870-1902, Martens 1890-1900, Baker 1930, Correa-Sandoval 1999, 2000, 2003), in the northern part of the State of Puebla (Baker 1930), and in about the center of the State of Yucatan (Chichen Itza) (Richards 1937, Harry 1950). Dall (1926) recorded the species from Tres Marias Islands (Maria Madre), State of Nayarit and from the Revillagigedo Archipelago (Socorro Island), State of Colima.

SUBULINIDAE

The family Subulinidae has representatives in Europe as well as in tropical America (Boss 1982). The genus *Subulina* Beck, 1837 has various tropical species. *Leptinaria* Beck, 1837 and *Lamellaxis* Strebel and Pfeiffer, 1882 inhabit the American tropics (according to Thiele [1935], *Lamellaxis* is a section of *Leptinaria*), and *Opeas* Albers, 1850 has a subtropical and tropical distribution (Thiele 1935).

The family is mainly distributed in the Gulf of Mexico states from the north to the Peninsula of Yucatan, with some records in the Peninsula of Baja California and the Mexican Pacific States. So far, the family shows a more tropical distribution. In Mexico, the Subulinidae is represented by

twenty-one species and subspecies in six genera: *Allopeas* Baker, 1935 (3), *Diaopeas* Haas, 1962 (1), *Lamellaxis* (8), *Leptinaria* (2), *Opeas* (5), and *Subulina* (2).

Allopeas gracile (Hutton, 1834) is from the southern part of the State of Baja California Sur (Smith *et al.* 1990) and mid-southern part of the State of Sonora (Drake 1953, Naranjo-García 1991), in eastern Mexico from the west central part of the State of Tamaulipas (Correa-Sandoval 2002, 2003), the eastern part of the State of San Luis Potosí (Correa-Sandoval 1997, 2003), the mid-northern part of the State of Campeche (Thompson 1967b), and from the northwestern and center portions of the State of Yucatán (Bequaert and Clench 1933, 1938). This species was described from India, nowadays it is distributed world wide; however, Pilsbry (1946) considered the species as native to tropical America.

Allopeas micra micra (D'Orbigny, 1835) is recorded from eastern Mexico, that is from the southern mid-part of the State of Tamaulipas (Martens 1890-1901, Correa-Sandoval 2002), the southeastern part of the State of San Luis Potosí (Correa-Sandoval 1997), from the center of the State of Veracruz (Correa-Sandoval 2000), from the southern and center of the State of Tabasco (Martens 1890-1901, Correa-Sandoval 1999), from the center of the State of Yucatán, and from the State of Quintana Roo (Cozumel Island) (Richards 1937). *Allopeas micra micra* (D'Orbigny, 1835) is *Leptoepas micra* (D'Orbigny, 1835) with the studies of Thompson (2008: 538).

The following taxa have been recorded from a single locality: *Allopeas micra mazatlanica* (Pilsbry, 1931) is from the State of Sinaloa (Isla del Faro) (Pilsbry 1931). From the State of Veracruz various species were recorded: *Lamellaxis argutus* (Pilsbry, 1906) is from the center (Orizaba) (Pilsbry 1906) as is *Leptinaria im perforata* (Strebel, 1882) (Jalapa) (Martens 1890-1901), and from the south is *Lamellaxis interstriatus* (Tate, 1870) (Naranjo-García 2003). *Lamellaxis exiguus* (Martens, 1898) is from the southern part of the State of Tabasco (Teapa) (Martens 1890-1901), and *Lamellaxis semistriatus* (Morelet, 1851) is from the northern part of the State of Chiapas (Palenque) (Morelet 1851, Martens 1890-1901). *Lamellaxis argutus* (Pilsbry, 1906), *Leptinaria im perforata* (Strebel, 1882), and *Lamellaxis semistriatus* (Morelet, 1851) change to the following species names according to Thompson (2008: 536, 535, 540): *Leptoepas argutus* (Pilsbry, 1906), *Lamellaxis im perforatus* Strebel, 1882, and *Leptoepas semistriatum* (Morelet, 1851), respectively.

Diaopeas beckianum (Pfeiffer, 1846) is from the southern part of the State of Tamaulipas (Correa-Sandoval 1999, 2002, 2003), the southeastern part of the State of San Luis Potosí, and in the northern and southern parts of the State of Veracruz (Correa-Sandoval 1999, 2000, 2003, Naranjo-García 2003), and in the State of Tabasco (no locality given) (Correa-Sandoval 1999). *Diaopeas beckianum* (Pfeiffer, 1846) changed

to *Beckianum beckianum* (Pfeiffer, 1846) in Thompson's work (2008: 523).

Lamellaxis martensi (Pfeiffer, 1856) is from the center (Martens 1890-1901) and southern part (Naranjo-García 2003) of the State of Veracruz. *Lamellaxis mexicanus mexicanus* (Pfeiffer, 1866) is from the mid-southern part of the State of Tamaulipas (Correa-Sandoval 2002, 2003), from the eastern part of the State of San Luis Potosí (Correa-Sandoval 1997), and from the mid-northern part of the State of Veracruz (Martens 1890-1901, Correa-Sandoval 2000). *Lamellaxis mexicanus abbreviatus* (Martens, 1898) and *Lamellaxis mexicanus turrinus* (Martens, 1898) are both from various sites in the center of the State of Veracruz (Martens 1890-1901).

Leptinaria tamaulipeasis Pilsbry, 1903 is from the mid-southern part of the State of Tamaulipas (Pilsbry 1903, Correa-Sandoval 2002) and the southeastern part of the State of San Luis Potosí (Correa-Sandoval 1997). Thompson (2008: 526) considers that *Leptinaria tamaulipensis* Pilsbry, 1903 should be *Lamellaxis tamaulipensis* (Pilsbry, 1903).

Opeas colimense (Crosse and Fischer, 1859) is from the State of Colima and the center of the State of Veracruz (Cordova) (Martens 1890-1901). In Thompson's work (2008: 537), *Opeas colimense* (Crosse and Fischer, 1859) is *Leptoepas colimense* (Crosse and Fischer, 1859). *Opeas odiosum* Pilsbry, 1899 and *O. patzcuarensis* Pilsbry, 1899 are from the vicinity of Patzcuaro in the State of Michoacán (Pilsbry 1899). *Opeas pumilum* Pfeiffer, 1840 is from the northern end of the Peninsula of Baja California (Smith *et al.* 1990) and the southern part of the State of Veracruz (Naranjo-García 2003). *Opeas rhoadsae* Pilsbry, 1899 is from the west central part of the State of Nuevo León (Diente) (Pilsbry 1899).

Subulina octona (Bruguère, 1789) is found in eastern Mexico from the southern part of the States of Tamaulipas (Correa-Sandoval 2002, 2003) and San Luis Potosí (Correa-Sandoval 1997, 2003), from the west center of the State of Veracruz (Martens 1890-1901, Correa-Sandoval 2000), in the southwestern part of the State of Tabasco (Martens 1890-1901), at the southwestern part of the State of Campeche, and at the northwestern part of the State of Yucatán (Martens 1890-1901, Correa-Sandoval 1999). It is a widely distributed species around the world (Martens 1890-1901). *Subulina porrecta* Martens, 1898 is from the southwestern part of the State of Tabasco (Teapa), and from the State of Yucatán (Martens 1890-1901). To Thompson (2008: 639), *Subulina porrecta* Martens, 1898 belongs to the family Spiraxidae under *Mayaxis porrecta* (Martens, 1898).

MEGOMPHICIDAE

The Megomphicidae is represented in Mexico with one member of the subfamily Ammonitellinae. According to

Pilsbry (1939), the subfamily Ammonitellinae is a declining ancient group present in the western United States (Washington, Montana, Oregon, and California). *Glyptostoma* Bland and Binney, 1873 is one of four genera that form this subfamily and the genus is found from San Gabriel Range, California to Ensenada, State of Baja California (Pilsbry 1939). *Glyptostoma newberryanum depressum* Bryant, 1902 is found in the northwestern corner of the State of Baja California (Smith *et al.* 1990). Pilsbry (1939) stated that it needs further anatomical studies and Smith *et al.* (1990) consider it a weakly characterized subspecies.

SYSTROPHIIDAE

The family Systrophidae comes from South America (Boss 1982) where various genera and species thrive. The Systrophidae inhabit the east central part of Mexico in the State of San Luis Potosi, in northern part of the State of Puebla, and at the center of the State of Veracruz. There are some records of the family in the central coast of the State of Campeche and south corner of the State of Yucatan. It has four Mexican species in the genus *Miradiscops* Baker, 1925.

Miradiscops haplococclion Thompson, 1967 is from the central coast of the State of Campeche (Thompson 1967b). *Miradiscops maya* (Pilsbry, 1920) is from the southern corner of the State of Yucatan (Thompson 1967b). *Miradiscops opal* (Pilsbry, 1920) and *Miradiscops puncticipitis* (Pilsbry, 1926) have similar distributions. They both are found in the eastern part of the State of San Luis Potosi (Correa-Sandoval 1997), the northern part of the State of Puebla, and in the west central part of the State of Veracruz (Baker 1930). *Miradiscops puncticipitis* is also found in the southern part of the State of San Luis Potosi (Correa-Sandoval 1997).

HAPLOTREMATIDAE

The Haplotrematidae is mainly in the western United States with various species. According to Burch (1962), the family comes from North America although it has representatives in the Antilles, Central America, and northern South America (Boss 1982).

In Mexico, it consists of the genus *Haplotrema* Ancy, 1881 with four species.

The species *Haplotrema caelatum* (Mazzyk, 1886) and *Haplotrema transfuga* (Hemphill, 1892) inhabit the northwestern end of the State of Baja California (Smith *et al.* 1990).

Haplotrema guadalupensis Pilsbry, 1927 is from Guadalupe Island, State of Baja California (Pilsbry 1927). A fourth taxon is an undescribed species reported by Correa-Sandoval (2003) from the States of Nuevo Leon and Tamaulipas on the eastern side of Mexico.

PUNCTIDAE

The Punctidae is mainly distributed in the northern hemisphere with some representatives in the south (South Africa) as is the case of the genus *Punctum* Morse, 1864 (Pilsbry 1948).

The Mexican distribution of Punctidae is scattered. It is found in the northern part of the State of Baja California, in the States of Nayarit, Jalisco, Colima, and Federal District (Mexico City), northern part of the State of Puebla, southeastern part of the State of San Luis Potosi, and in the States of Tamaulipas and Nuevo Leon. The Punctidae is represented in Mexico by seven species and subspecies in the genera *Paralaoma* Iredale, 1913 (3) and *Punctum* (4).

Paralaoma caputspiniulae caputspiniulae (Reeve, 1852) is from the northern part of the State of Baja California (Smith *et al.* 1990). *Paralaoma caputspiniulae jaliscoensis* (Pilsbry, 1926) is from the central part of the State of Jalisco (Pilsbry 1926, Baker 1930) and from the western part of the Federal District (Mexico City) (Baker 1927, 1930). Thompson (2008: 675) considers *Paralaoma caputspiniulae caputspiniulae* (Reeve, 1852) to be a synonym of *Paralaoma servilis*; in addition, this species has been introduced in various temperate areas around the globe. Yet, *Paralaoma caputspiniulae jaliscoensis* (Pilsbry, 1926) is *Punctum conspectum jaliscoensis* (Pilsbry, 1926) under Thompson's (2008: 678) studies. *Paralaoma vitreum* (Baker, 1930) is from the western part of the State of Nuevo Leon (Correa-Sandoval 1997, 2003) and from the center of the States of Tamaulipas (Correa-Sandoval 2002) and Veracruz (Baker 1930).

Punctum minutissimum (Lea, 1841) is from the northern part of the State of Puebla (Baker 1930, Pilsbry 1948), the eastern part of the State of San Luis Potosi (Correa-Sandoval 1997, 1998, 2003), and in the Pacific islands: Islas Tres Marias (Maria Magdalena) of the State of Nayarit and in the Revillagigedo Archipelago (Socorro Island) State of Colima [as *Punctum pygmaeum* (Draparnaud, 1801)] (Dall 1926).

The two subspecies *Punctum minutissimum rotundum* (Dall, 1926), and *Punctum minutissimum albeolum* (Dall, 1926), and the species *Punctum planatum* Dall, 1926 are from the Tres Marias Islands, State of Nayarit, both subspecies are present at Maria Magdalena Island, and *P. m. albeolum* and *P. planatum* are also present at Maria Madre Island (Dall 1926). Thompson (2008: 679) considers *Punctum planatum* Dall, 1926 to be a synonym of *Chanomphalus pilsbryi* (H. B. Baker, 1927).

HELICODISCIDAE

The origin of the genus *Helicodiscus* Morse, 1864 is Nearctic (Bequaert and Miller 1973). *Chanomphalus* Strebel

and Pfeffer, 1880 is in Mexico and Central America (Thiele 1935) and according to Pilsbry (1948), *Radiodiscus* Pilsbry and Ferriss, 1906 comes from South America where the genus is well represented by various species. The Helicodiscidae is found on the east coast of Mexico down to the southern part of the State of Veracruz. In the west it is found in the northern states of Baja California Sur, Sonora, and Chihuahua, and at the center of Mexico in the central States of Michoacán and the Federal District (Mexico City).

The Helicodiscidae contains six Mexican species and subspecies in three genera, *Chanomphalus* (1), *Helicodiscus* (2), and *Radiodiscus* (3).

Chanomphalus pilsbryi (H. B. Baker, 1927) is found from the mid-southern part of the State of Tamaulipas (Correa-Sandoval 1999, 2002) to the eastern part of the State of San Luis Potosí (Correa-Sandoval 1998), northern part of the State of Puebla (Baker 1927, 1930), and from the north to south in the State of Veracruz (Baker 1927, 1930, Correa-Sandoval 2000, Naranjo-García 2003).

Helicodiscus eigenmanni Pilsbry, 1900 is from the northern part of the States of Chihuahua and Sonora (Pilsbry 1948) and also from the northern part of the State of Puebla (Baker 1930). *Helicodiscus singleyanus* (Pilsbry, 1889) is from Catalina Island and the south tip of the State of Baja California Sur (Smith *et al.* 1990). In the State of Sonora it is found in the north central (Naranjo-García 1991) and the southern parts (Branson *et al.* 1964).

Radiodiscus millicostatus costaricanus Pilsbry, 1926 is from the western part of the Federal District (Mexico City) (Baker 1930) and the northern part of the State of Puebla (Baker 1927, 1930). *Radiodiscus millicostatus millicostatus* Pilsbry and Ferriss, 1906 is from the northern part of the State of Chihuahua, the central part of the State of Michoacán (Pilsbry 1948) and from the State of Tamaulipas (without given localities) (Bequaert and Miller 1973). *Radiodiscus proameri* Baker, 1930 is from the northern part of the State of Puebla (Baker 1930) and the west central part of the State of Veracruz (Baker 1928, 1930).

CHAROPIDAE

The Charopidae is of South American origin (Miquel *et al.* 2004). It is found in the center of Mexico, with one Mexican species with two subspecies. The subspecies *Rotadiscus hermanni hermanni* (Pfeiffer, 1866) inhabits the northern part of the State of Puebla, the center of the State of Veracruz, and to the south it inhabits the center and western part of the State of Michoacán (Pilsbry 1891, 1903, Díaz de León 1912, Baker 1927, 1930). *Rotadiscus hermanni nivatus* Baker, 1930 was described from Desierto de Los Leones, west of the Federal District (Mexico City) (Baker 1928, 1930).

DISCIDAE

The genus *Discus* Fitzinger, 1833 is of Holarctic origin, considered by Pilsbry (1948) as wide spread; Bequaert and Miller (1973) propose this genus evolved earlier somewhere in Eurasia, since that region has more fossil records and more Recent species than in America. In Mexico Discidae contains two species in two genera.

Discus whitneyi (Newcomb, 1864) is found in the northern part of the State of Chihuahua (Bequaert and Miller 1973). *Gonyodiscus victorianus* (Pilsbry, 1904) is in the mid-southern part of the State of Tamaulipas (Pilsbry 1903, Baker 1930, Hinkley 1907, Correa-Sandoval 2002, 2003), in the eastern part of the State of San Luis Potosí (Correa-Sandoval 1998, 2003), and in the northern part of the States of Puebla and Veracruz (Baker 1930, Correa-Sandoval 2000). Thompson (2008: 693) considers *Gonyodiscus victorianus* (Pilsbry, 1904) to be a synonym of *Radiocentrum victoriana* (Pilsbry, 1904) of the family Oreohelicidae.

OREOHELICIDAE

The Oreohelicidae is found in Canada, the Rocky Mountains, and northern Mexico (Pilsbry 1939, Boss 1982). The family is distributed in the north and northwest side of Mexico in the States of Sonora, Chihuahua, and the Peninsula of Baja California. Seven species in two genera comprise the Oreohelicidae in Mexico: *Oreohelix* Pilsbry, 1904 (3) and *Radiocentrum* Pilsbry, 1905 (4).

Known from a single locality are the species *Oreohelix caenosa* Pilsbry, 1948 and *Oreohelix labrenana* Pilsbry, 1948 which are in the northwestern part of the State of Chihuahua (Pilsbry 1948, Clench and Turner 1962). Thompson (2008: 693) considers that the correct epithet of *O. labrenana* Pilsbry, 1948 is *Radiocentrum labrenana* (Pilsbry, 1948). From the southern part of the same State (Cueva del Diablo) is the species *Radiocentrum almoloya* (Drake, 1949) (Drake 1949). *Oreohelix concentrata* (Dall, 1895) is from the northern part of the State of Sonora (San José Mountains) (Pilsbry 1939, Bequaert and Miller 1973), and *Radiocentrum orientalis* Metcalf, 1980 is from the northern part of the State of Coahuila (Metcalf 1980).

Radiocentrum exorbitans (Miller, 1973) is from the middle part of the State of Baja California Sur (Smith *et al.* 1990) and from the southern end of the same State is the species *Radiocentrum discus* Christensen and Miller, 1976 (Smith *et al.* 1990).

SUCCINEIDAE

The Succineidae is of worldwide distribution (Thiele 1935, Pilsbry 1948, Boss 1982). In Mexico it is distributed in

the northwestern part of the State of Baja California, the central region of Mexico over the Trans-Mexican volcanic belt morphotectonic Province (Ferrusquia-Villafranca 1993) (Fig. 4), and from the southern part of the State of Tamaulipas to the north central part of the State of Veracruz. In Mexico it has twenty-four species and subspecies in three genera *Catinella* Pease, 1870 (1), *Oxyloma* Westerlund, 1885 (1), and *Succinea* Draparnaud, 1815 (22). *Catinella rehderi* (Pilsbry, 1948) is found in the northern, center, and the southern parts of the Peninsula of Baja California (Smith *et al.* 1990). *Oxyloma nuttallianum* (Lea, 1841) is from a single locality in the central part of the State of Baja California Sur. Most of its distribution range is located in the northwestern United States (Pilsbry 1948, Bequaert and Miller 1973).

Succinea ampullacea Martens, 1898 is from the center of the State of Jalisco (Ameca) (Martens 1890-1901) and from the southern part of the State of Sonora (between Guaymas and Ciudad Obregón) (Branson *et al.* 1964). *Succinea avara* Say, 1824 is from the center coast of the State of Campeche (Pantel Aguada) (Bequaert and Clench 1936). Its main distribution occurs in Canada and the northeastern United States with the closest locations to Mexico being Florida and Texas. Pilsbry (1948) mentioned that it is found in northwestern Mexico without giving specific localities. Thompson (2008: 264) considers *Succinea avara* Say, 1824 to be a synonym of *Catinella avara* (Say, 1824).

Recorded from a single locality are the following species: *Succinea brevis* Dunker in Pfeiffer, 1850 from the northwestern part of the State of Hidalgo (Zimapan) (Martens 1890-1901); *Succinea californica* Crosse and Fischer, 1878 from the north end of the State of Baja California (Smith *et al.* 1990); *Succinea carmenensis* Fischer and Crosse, 1878 from the State of Campeche (Carmen Island); *Succinea colorata* Fischer and Crosse, 1878 and *Succinea guatemalensis* Morelet, 1849 at the center of the State of Tabasco (Villahermosa) (Pilsbry 1900); *Succinea campestris* Say, 1817 from the eastern part of the State of Mexico (Lake Texcoco) (Martens 1890-1901). However, *Succinea campestris* is mostly found in the United States from Florida and North and South Carolina (Pilsbry 1948). *Succinea guadalupensis* Dall, 1900 is from the northwestern part of the State of Baja California (Guadalupe Island) (Smith *et al.* 1990). *Succinea peublensis* Crosse and Fischer, 1878 is from the west center of the State of Puebla (City of Puebla) (Fischer and Crosse 1870-1902, Martens 1890-1901, Díaz de León 1912). *Succinea socorroensis* Dall, 1926 is from the Revillagigedo Archipelago (Socorro Island), State of Colima (Dall 1926). *Succinea talpamensis talpamensis* Pilsbry, 1899 is from the southern part of the Federal District (Mexico City, Talpan) (Pilsbry 1899). *Succinea talpamensis cuitseana* Pilsbry, 1899 is from the north northeastern part of the State of Michoacan (Lake Cuitseo near Huingo) (Pilsbry 1899, Clench and Turner 1962). Thompson (2008: 266) considers that the correct

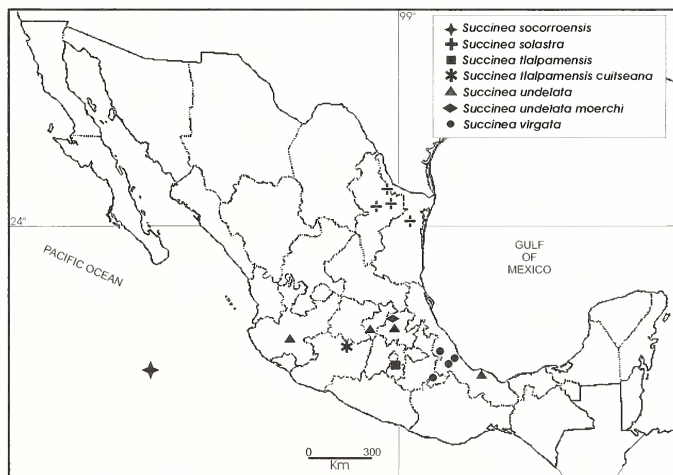


Figure 4. Distribution in the Trans-Mexican volcanic belt of various species of *Succinea*.

epithets of *Succinea tlalpamensis tlalpamensis* Pilsbry, 1899 and *Succinea tlalpamensis cuitseana* Pilsbry, 1899 are *Oxyloma tlalpamensis tlalpamensis* (Pilsbry, 1899) and *Oxyloma tlalpamensis cuitseana* (Pilsbry, 1899). *Succinea undulata moerchi* Dunker in Paetel, 1889 is from the northwestern part of the State of Hidalgo (Zimapan) (Martens 1890-1901).

Succinea concordalis Gould, 1848 is from the northern part of the State of Veracruz (Tuxpan) (Martens 1890-1901, Díaz de León 1912, Correa-Sandoval 1999, 2003) and southern part of the State of San Luis Potosí (Huichihuayan) (Correa-Sandoval 1999). *Succinea luteola luteola* Gould, 1848 is from the northern part of the State of Sonora (Branson *et al.* 1964), in the northern part of the State of Chihuahua (Lake Palomas, Valle de los Mimbres) (Dall 1897, Díaz de León 1912, Bequaert and Miller 1973), in the southern part of the State of Tamaulipas (Correa-Sandoval 1999, 2002, 2003), and in the northern part of the State of Veracruz (Correa-Sandoval 2000). It is also found in the eastern part of the State of San Luis Potosí (Ciudad Valles) (Correa-Sandoval 1999, 2003), at the center of the State of Guerrero (Venta del Zopilote) (Martens 1890-1901, Correa-Sandoval 1999), and from the northwestern part of the State of Yucatán (Progreso) (Martens 1890-1901). Pilsbry (1948) considers the species widely spread in the State of Veracruz and in the southeastern part of the State of Puebla (Tehuacán). *Succinea luteola sonoriensis* Fischer and Crosse, 1878 is found around the northeastern part of the State of Sonora (Bequaert and Miller 1973). *Succinea panncoensis* Pilsbry, 1909 is from the southeastern part of the State of San Luis Potosí (Pilsbry 1909, Clench and Turner 1962, Correa-Sandoval 1999, 2003), and from the southern part of the State of Tamaulipas (Pilsbry 1909, Clench and Turner 1962). *Succinea rusticana* Gould, 1846 is from the southern end of the State of Baja California Sur (Smith *et al.* 1990). *Succinea solastra* Hubricht, 1961 is from the center and northeastern part of the State of Nuevo León, and at the northwestern part of the State of Tamaulipas (Hubricht 1961, Correa-Sandoval 2003). *Succinea undulata* Say, 1829 is from the southwestern part of the State of Guanajuato (Irapuato near Lerma) at the center of the State of Jalisco (Sayula), at the south central coastal part of the State of Veracruz (Santecomapan) (Martens 1890-1901, Díaz de León 1912), and from the southwestern part of the State of Querétaro (near the City of Querétaro) (Pilsbry 1925). *Succinea virgata* Martens, 1865 is from the central part of the State of Veracruz (Martens 1890-1901, Pilsbry 1903, Díaz de León 1912) and the southeastern part of the State of Puebla (Martens 1890-1901, Díaz de León 1912).

SAGDIDAE

According to Boss (1982), the family Sagdidae ranges from Florida south to the Antilles and Venezuela. It is a family

of the tropics and subtropics of America (Pilsbry 1940). The Sagdidae in Mexico is represented only by the species *Xenodiscula taintori* Goodrich and van der Schalie, 1937 from the southern part of the State of Veracruz at Los Tuxtlas Biological Station (Naranjo-García 2003). It was originally described from Guatemala, at El Petén (Goodrich and van der Schalie 1937) and it has recently been collected from Nicaragua (Pérez *et al.* 2008). As far as we know, the only other species of *Xenodiscula* in the Americas is in Venezuela (Pilsbry 1919a).

GASTRODONTIDAE

The Gastrodontidae is Holarctic (Boss 1982); in addition, there are some representatives of it in Bermuda and Madeira (Pilsbry 1946). In Mexico, the Gastrodontidae is mainly in the east in various states of the Gulf of Mexico, reaching the northern part of the State of Chiapas, and in western Chiapas from the northwestern corner to the north central portion.

In Mexico Gastrodontidae is represented by five species in three genera: *Pseudohyalina* Morse, 1864 (1), *Striatura* Morse, 1864 (2) and *Zonitoides* Lehmann, 1862 (2).

Pseudohyalina cidarisus Martens, 1892 is from the northern part of the State of Chiapas (Palenque) (Martens 1890-1901). Thompson (2008: 681) considers that this taxon belongs to the family Charopidae as *Choanompalus cidarisca* (Martens, 1892).

Striatura (*Striatura*) *pugetensis* (Dall, 1895) is from Guadalupe Island, State of Baja California (Pilsbry 1946, Smith *et al.* 1990). *Striatura* (*Striatura*) *meridionalis* (Pilsbry and Ferris, 1906) is from south central Tamaulipas (Correa-Sandoval 2002), from near the center of the State of Nuevo León (Pabillón) (Pilsbry 1946, Contreras-Arquieta 1995—without giving precise localities), from the northern part of the State of Puebla (Necaxa) (Baker 1930), and from the center of the State of Veracruz (Orizaba) (Pilsbry 1946).

Zonitoides arborens (Say, 1816) is from the State of Chihuahua (Bequaert and Miller 1973), from the central western part of the State of Nuevo León (Pilsbry 1903, Contreras-Arquieta 1995—no localities given), from the southeastern part of the State of San Luis Potosí (Correa-Sandoval 1997), northern part of the State of Puebla (Baker 1930), and from the center of the State of Veracruz (Martens 1890-1901, Pilsbry 1903, 1946, Baker 1930). Dall (1926) recorded *Zonitoides socorroensis* Dall, 1926 from the Revillagigedo Archipelago (Socorro Island), State of Colima. Thompson (2008: 721) places *Zonitoides socorroensis* Dall, 1926 under *Nesovitrea snbhyalina socorroensis* (Dall, 1926) of the family Zonitidae.

EUCONULIDAE

The genus *Euconulus* Reinhardt, 1883 is Holarctic with the genera *Guppya* Mörch, 1867 and *Habroconus* Fischer and Crosse, 1872 occurring in tropical and subtropical Americas. They are found from latitude 25°38'N south to eastern Mexico (Pilsbry 1939). The Euconulidae is distributed mainly on Mexico's east coast, with some western records in the States of Baja California, Sonora, Jalisco, and Michoacan. The Euconulidae has seventeen Mexican species in three genera: *Euconulus* (1), *Guppya* (12), and *Habroconus* (4).

Euconulus fulvus (Müller, 1774) is on the northwestern side of Mexico in the northern part of the State of Baja California (Smith *et al.* 1990), in the southern part of the State of Sonora (Naranjo-García 1991), and in the northwestern part of the State of Chihuahua (Bequaert and Miller 1973). There is one record of the species, as a fossil from the Pleistocene, in the northern part of the State of San Luis Potosí (Olivera-Carrasco 2007).

Guppya biolleyi Martens, 1892 is from the northern part of the State of Puebla (Baker 1930) and the south coastal part of the State of Veracruz (Naranjo-García 2003).

The following species are known only from their type locality: *Guppya capsula* Dall, 1926 and *Guppya montanica* Dall, 1926 are from Socorro Island of the Revillagigedo Archipelago, State of Colima (Dall 1926); *Guppya jalisco* Pilsbry, 1919 from the center of the State of Jalisco (Guadalajara) (Pilsbry 1919b), and *Guppya sterkii punctum* Baker, 1930 from the northern part of the State of Puebla (Necaxa) (Baker 1930).

Guppya elegans (Strebel, 1880) is from the west central part of the State of Veracruz and at the northwestern part of the State of Morelos (Martens 1890-1901, Pilsbry 1919b). *Guppya gundlachi gundlachi* (Pfeiffer, 1840) is from the west central part of the State of Tamaulipas (Pilsbry 1903), the southeastern part of the State of San Luis Potosí (Correa-Sandoval 1997), at Carmen Island (Martens 1890-1901, Díaz de León 1912), along the central coast of the State of Campeche (Thompson 1967b), at Cozumel Island (Rehder 1966, Thompson 1967b), and the southwestern part of the State of Quintana Roo (Thompson 1967b). *Guppya gundlachi orosciana* Martens, 1892 is found in the west central part of the State of Veracruz (Baker 1930). *Guppya miamensis* Pilsbry, 1903 is found in the south coastal part of the State of Veracruz (Naranjo-García 2003). *Guppya micra* Pilsbry, 1903 is from the west central part of the State of Tamaulipas (Pilsbry 1903), the eastern part of the State of San Luis Potosí (Correa-Sandoval 1997), and from the central part of the State of Michoacan (Pilsbry 1903). *Guppya perforata* Dall, 1926 and *Guppya socorroana* Dall, 1926 are from the Tres Marias Islands, State of Nayarit; *Guppya perforata* from María Madre, both from María Magdalena (Dall 1926), and in

addition *Guppya socorroana* is recorded from the Revillagigedo Archipelago (Socorro Island), State of Colima (Dall 1926).

Habroconus pittieri (Martens, 1892) is from the southern tip of the State of Yucatan, is scattered throughout the State of Campeche, and occurs in the central and southwestern portions of the State of Quintana Roo (Thompson 1967b). *Habroconus trochulinus* (Morelet, 1851) is from the northern part of the State of Puebla (Baker 1930), and the west central part of the State of Veracruz (Martens 1890-1901, Pilsbry 1903, Baker 1930). *Habroconus elegantulus* (Pilsbry, 1919) is on both the Gulf of Mexico and Pacific coasts of Mexico. It is known from the west central part of the State of Nuevo Leon (Pilsbry 1919), from the southwestern part of the State of Tamaulipas (Pilsbry 1919b), the eastern part of the State of San Luis Potosí (Correa-Sandoval 1997), the northern part of the State of Puebla (Baker 1930), the west central part of the State of Veracruz (Baker 1930), and from the center of the States of Jalisco and Michoacan (Pilsbry 1919b). *Habroconus selenkai* (Pfeiffer, 1866) is from the northern part of the State of Puebla and from the west central part of the State of Veracruz (Baker 1930).

VITRINIDAE

The Vitrinidae is Holarctic (Boss 1982) and is distributed mainly in eastern Mexico with various records in the State of Sonora. In Mexico the Vitrinidae contain three species in two genera: *Pycnogrya* Strebel and Pfeffer, 1880 (1) and *Hawaia* Gude, 1911 (2).

Pycnogrya berendti (Pfeiffer, 1861) is found in the northern part of the State of Puebla (Baker 1930) and at the central part of the State of Veracruz (Martens 1890-1901, Pilsbry 1903, Baker 1928, 1930). *Pycnogrya* is only known from Mexico (Thiele 1935).

Hawaia minuscula (Binney, 1840) is from the eastern (north and south) part of the State of Sonora (Branson *et al.* 1964, Naranjo-García 1991), from the central part of the State of Tamaulipas (Correa-Sandoval 1999, 2002, 2003), the eastern part of the State of San Luis Potosí (Correa-Sandoval 1997), the northern (Correa-Sandoval 2000), and southern parts (Naranjo-García and Polaco 1997, Naranjo-García 2003) of the State of Veracruz, from the western (Martens 1890-1901), the central coastal portions (Thompson 1967b) of the State of Campeche, and the northern part of the State of Chiapas (Palenque) (Bequaert 1957). In addition, Bequaert and Miller (1973) mentioned that *Hawaia minuscula* has been recorded from the States of Baja California, Nayarit, Puebla, and Yucatan without giving exact localities. Reddell (1981) found it in caves from the States of Campeche, Veracruz, and Yucatan. Smith *et al.* (1990) recorded an undescribed *Hawaia* from the State of Baja California and commented on the necessity of further

studies to determine its specific epithet. *Hawaia* is a native Nearctic snail but had been widely dispersed by humans (Bequaert and Miller 1973).

Thompson (2008: 735) places both genera *Pygoglypta* and *Hawaia* in the family Zonitidae.

ZONITIDAE

The Zonitidae is of worldwide distribution (Thiele 1935, Burch 1962, Boss 1982). In Mexico, the distribution is mostly in the eastern part of the country from the center of the States of Nuevo Leon and Tamaulipas down to central Veracruz with a few localities in the States of Guerrero, Oaxaca, and Chiapas. In the northwest, there are various records from the State of Sonora. The family Zonitidae, in Mexico, has eighteen species and subspecies in four genera *Glyphyalinia* von Martens, 1892 (2), *Mesomphix* Rafinesque, 1819 (14), *Retinella* Fischer in Suttleworth, 1877 (1), and *Zonites* Montfort, 1810 (1).

Glyphyalinia indentata (Say, 1822) is from the east side of the State of Sonora (Naranjo-García 1991); there are some records of the species in the eastern central part of the State of Nuevo Leon (Correa-Sandoval 1993, Correa-Sandoval and Salazar 2005), at the center of the State of Tamaulipas (Correa-Sandoval 2002), and at the eastern part of the State of San Luis Potosí (Correa-Sandoval 1998). In these last three states, the species is less frequent (Correa-Sandoval 2002). The subspecies *Glyphyalinia indentata paucilirata* (Morelet, 1851) is from the northern part of the State of Puebla and from the eastern part of the State of Mexico (Teotihuacan) (Baker 1930). Bequaert and Miller (1973) recorded it from the States of Baja California, Sonora, and Chihuahua without giving specific localities.

Mesomphix zonites (Pfeiffer, 1845) is from the southern part of the State of Veracruz (Tuxtla) (Martens 1890-1901) and from the west central part of the State of Chiapas (Martens 1890-1901, Bequaert 1957). *Mesomphix lucubratilis caducus* (Pfeiffer, 1846) and *Mesomphix lucubratilis lucubratilis* (Say, 1829) are from the central part of the State of Veracruz (Martens 1890-1901, Baker 1930). *Mesomphix lucubratilis strebelianus* (Martens, 1892) is also found around the same region plus at the northern part of the State of Puebla (Necaxa) (Martens 1890-1901, Baker 1930). *Mesomphix montereyensis montereyensis* Pilsbry, 1899 is from the west central part of the State of Nuevo Leon (Diente) (Pilsbry 1899, 1903) and in the west central part of the State of Tamaulipas (Correa-Sandoval 2002).

Mesomphix montereyensis victorianus (Pilsbry, 1903) is from the west central part of the State of Tamaulipas (Correa-Sandoval 1999, 2002) and from the eastern part of the State of San Luis Potosí (Correa-Sandoval 1997). Thompson (2008: 733) considers that *Mesomphix montereyensis montereyensis* Pilsbry, 1899 and *Mesomphix montereyensis victorianus* (Pilsbry, 1903)

are *Patulopsis montereyensis montereyensis* (Pilsbry, 1899) and *Patulopsis montereyensis victorianus* (Pilsbry, 1903), respectively. *Mesomphix paradensis* (Pfeiffer, 1860) is from the central part of the States of Veracruz and Oaxaca (Martens 1890-1901).

Various species are recorded from a single locality: at the center of the State of Veracruz are *Mesomphix salleanus* Martens, 1892 (Cordoba) (Martens 1890-1901) and *Mesomphix tuxtliensis* Crosse and Fischer, 1870 (Tuxtla [sic]) (Baker 1930). *Mesomphix sculptus* (Martens, 1892) is from the center of the State of Guerrero (Omiteme) (Martens 1890-1901), and *Zonites tehuantepecensis* Crosse and Fischer, 1870 is from the coastal part of the State of Oaxaca (Tehuantepec) (Martens 1890-1901). *Mesomphix veracruzensis* (Pfeiffer, 1856) and *Mesomphix modestus* Martens, 1892 are found at various localities at the center of the State of Veracruz (Martens 1890-1901, Baker 1930). *Mesomphix carinatus* (Strebel and Pfeffer, 1880) and *Retinella subhyalina subhyalina* (Pfeiffer, 1867) are from the central part of the State of Veracruz and from the northern part of the State of Puebla (around Necaxa) (Martens 1890-1901, Baker 1930). *Mesomphix bilineatus* (Pfeiffer, 1845) is from the west central part of the State of Veracruz (Cordoba) (Martens 1890-1901, Baker 1930) and in the northeastern part of the State of Chiapas (Laguna Ocotal) (Bequaert 1957). From the preceding paragraph, the species that change considering Thompson's (2008: 734, 720, 732, 717) ideas are: *Mesomphix salleanus* Martens, 1892 to *Patulopsis salleanus* (Martens, 1892), *Mesomphix veracruzensis* (Pfeiffer, 1856) to *Patulopsis veracruzensis veracruzensis* (Pfeiffer, 1856), *Mesomphix carinatus* (Strebel and Pfeffer, 1880) to *Patulopsis carinatus* Strebel and Pfeffer, 1880, *Retinella subhyalina subhyalina* (Pfeiffer, 1867) to *Nesovitrea subhyalina subhyalina* (Pfeiffer, 1867), and *Zonites tehuantepecensis* Crosse and Fischer, 1870 to *Zonitoides tehuantepecensis* (Crosse and Fischer, 1870) of the family Gastrodontiidae.

THYSANOPHORIDAE

The family Thysanophoridae is distributed from the southern United States to northern South America. It is well represented in Mexico and the Antilles (Pilsbry 1940, Boss 1982). In Mexico, Thysanophoridae is patchily spread (Figs. 5, 6). There are various records from the eastern part of the State of Baja California Sur, over the entire State of Sonora, and very few records in other western states. On the eastern side, the family is in the mid-southern part of the State of Tamaulipas, over the entire State of Veracruz, in the eastern part of the State of San Luis Potosí, the northern part of the State of Puebla, at the northeastern part of the State of Chiapas, and the northwestern part of the state of Yucatan. Over the Trans-Mexican volcanic

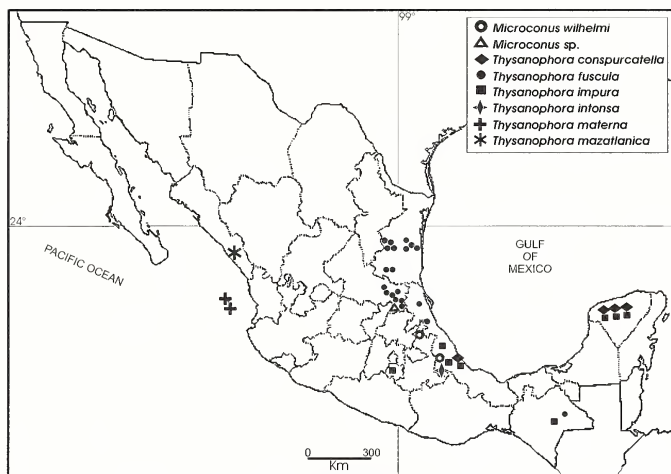


Figure 5. Distribution of various species of *Microconus* and *Thysanophora* in Mexico.

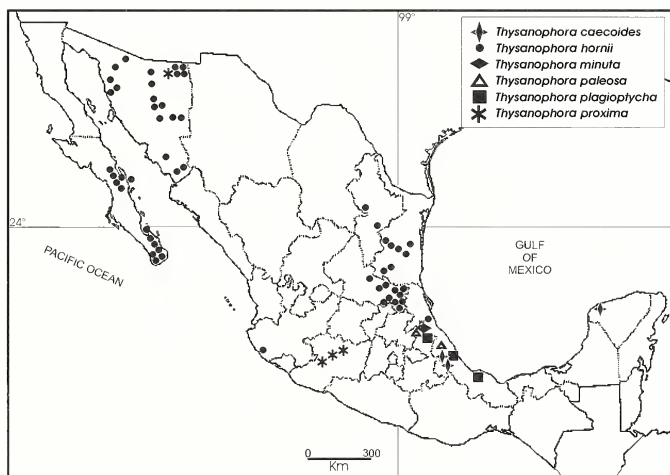


Figure 6. Distribution of various species of *Thysanophora* in Mexico.

belt few records occur. The family in Mexico has fifteen species in two genera: *Microconus* Strebel and Pfeiffer, 1880 (2) and *Thysanophora* Strebel and Pfeiffer, 1880 (13).

Microconus wilhelmi (Pfeiffer, 1866) is from the northern part of the State of Puebla (Necaxa) and in the center of the State of Veracruz (Mirador) (Baker 1927, Thompson 1958). There is an undescribed species of *Microconus* recorded by Correa-Sandoval (1999) from the southern part of the State of San Luis Potosí (Xilitla).

Thysanophora caecoides (Tate, 1870) is from the center of the State of Veracruz (Baker 1927) and at the northwestern part of the State of Yucatán (Progreso) (Pilsbry 1891, 1920).

Thysanophora clarionensis Dall, 1926 is from Isla Clarion and various other localities of the same island, Revillagigedo Archipelago, State of Colima (Dall 1926). *Thysanophora conspurcator* (Morelet, 1951) is from the center of the State of Veracruz (Antigua) (Pilsbry 1903) and west central part of the State of Yucatán (Martens 1890-1900). *Thysanophora fuscus* (C. B. Adams, 1849) is from the mid-southern part of the State of Tamaulipas (Pilsbry 1903, Correa-Sandoval 1999, 2002), northern part of the State of Veracruz (Correa-Sandoval 2000), the eastern part of the State of San Luis Potosí (Correa-Sandoval 1997), and the northeastern part of the State of Chiapas (Laguna Ocotlán and Monte Libano) (Bequaert 1957).

Thysanophora hornii (Gabb, 1866) is from the eastern part of the State of Baja California Sur (Smith *et al.* 1990), most of the State of Sonora (Naranjo-García 1991), from the southern half of the State of Tamaulipas (Pilsbry 1903, Correa-Sandoval 2002), from the mid-eastern part of the State of San Luis Potosí (Correa-Sandoval 1997), from the central coast of the State of Jalisco (Bequaert and Miller 1973, Naranjo-García, unpubl. data), from the mid-northern part of the State of Veracruz (Correa-Sandoval 2000), and from the States of Sinaloa, Chihuahua and Nuevo León (Bequaert and Miller 1973—without localities given). Bequaert and Miller (1973) consider the genus native of America and *Thysanophora hornii* as an invader from the south. Metcalf and Smartt (1997) also believe that this species has a neotropical origin. *Thysanophora impura* (Pfeiffer, 1866) is from the eastern part of the State of Morelos (Yautepec) (Pilsbry 1891), the center of the State of Veracruz (Pilsbry 1891, 1926, Baker 1927), from the west central region of Yucatán (Pilsbry 1926), and from the northwestern part of the State of Chiapas (Ocosingo) (Bequaert 1957).

Species from a single locality are: *Thysanophora intonsa* (Pilsbry, 1891) from the central part of the State of Veracruz (Orizaba) (Pilsbry 1891), *Thysanophora mazatlanica* (Pfeiffer, 1856) from the south coastal part of the State of Sinaloa (Mazatlán) (Martens 1890-1901), and *Thysanophora minuta* Baker, 1927 from northern part of the State of Puebla (near Necaxa) (Baker 1927).

Thompson (2008: 678) places *Thysanophora mazatlanica* (Pfeiffer, 1856) under *Punctum mazatlanica* (Pfeiffer, 1856) of the family Punctidae.

Thysanophora materna Dall, 1926 is from the Tres Marias Islands (María Madre and María Magdalena) of the State of Nayarit (Dall 1926). *Thysanophora paleosa* (Strebel and Pfeiffer, 1880) is from the northern part of the State of Puebla (Necaxa) and from the center of the State of Veracruz (Baker 1927). *Thysanophora proxima* Pilsbry, 1899 was found by Branson *et al.* (1964) in the northern part of the State of Sonora and it is also found in the northern and central portions of the State of Michoacán (Pilsbry 1903). *Thysanophora plagiopycha* (Shuttleworth, 1854) is from the northern part of the State of Puebla (Necaxa) (Baker 1927) and the central and southern portions of the State of Veracruz (Pilsbry 1940, Naranjo-García 2003).

HELMINTHOGLYPTIDAE

The Helminthoglyptidae is an American family found in the western United States (Boss 1982) and northwestern Mexico. The family Helminthoglyptidae had about 60 Mexican species before Schileyko (1991) revised the superfamily Helicoidea. He suggested the family Helminthoglyptidae be confined to the genera *Helminthoglypta* Ancy, 1887 and *Eremarionta* Pilsbry, 1913. The other genera, such as *Sonorella* Pilsbry, 1900, *Sonorelix* Berry, 1943, and *Greggeli* Miller, 1972 (formerly part of the Helminthoglyptidae) he placed in the Xanthonychidae.

The Mexican Helminthoglyptidae now contains ten species and subspecies in two genera *Eremarionta* (3) and *Helminthoglypta* (7).

The Helminthoglyptidae distributed in the State of Baja California are: *Eremarionta indioensis* (Yates, 1890), *Eremarionta rowelli bechteli* (Emerson and Jacobson, 1964), and *Helminthoglypta tudiculata* (Binney, 1843), also found at the northern part of the State of Baja California relatively close to the border with the United States are the species *Helminthoglypta coelata* (Bartsch, 1916), *Helminthoglypta misiona* Chace, 1937, and *Helminthoglypta reederi* Miller, 1981 (Sierra San Pedro Martir) (Smith *et al.* 1990).

From the islands of the same state, two subspecies were recognized. *Helminthoglypta hannah hannah* Pilsbry, 1927 and *Helminthoglypta hannah diodon* Pilsbry, 1927 inhabit Guadalupe Island (Pilsbry 1927, Clench and Turner 1962), and *Helminthoglypta traskii coronadoensis* (Bartsch, 1916) is found in the Coronado Island (Bartsch 1916). The species *Eremarionta rowelli rowelli* (Newcomb, 1865) is the only other member of the family that is found in the northwestern coast of the State of Sonora (Drake 1957, Bequaert and Miller 1973).

ARIONIDAE

The family Arionidae has a Holarctic origin (Pilsbry 1948); however, they may have spread to the south since members of the family are present in Africa (Burch 1962, Boss 1982). In the United States several genera are mainly distributed in the west (Pilsbry 1948). There is one Mexican species in the Arionidae, *Binneya guadalupensis* Pilsbry, 1927 from Guadalupe Island, State of Baja California (Pilsbry 1927, Smith *et al.* 1990). Thompson (2008: 739) recognizes the family Binneyidae Cockerell, 1891 in the superfamily Arionoidea instead of the family Arionidae.

PHILOMYCIDAE

The family Philomycidae is distributed in parts of Canada, eastern United States, tropical Central America and South America and parts of Asia (Pilsbry 1948, Burch 1962, Boss 1982). The family is patchily distributed in Mexico: in the northwestern part of the State of Sonora, in the center (Mexico City), in the northeastern region of the State of Puebla, and at the center of the State of Veracruz.

In Mexico, it is composed of three subspecies in the genus *Pallifera* Morse, 1864.

Pallifera arizonensis arizonensis (Pilsbry, 1917) is found in the northwestern part of the State of Sonora (Sierra Purica) (Bequaert and Miller 1973). *Pallifera costaricensis alticola* Baker, 1930 is found in the western part of the Federal District (Mexico City) (Desierto de los Leones) (Baker 1930). *Pallifera*

costaricensis crosseana (Strebel and Pfeffer, 1880) is from the northern portion of the State of Puebla to the west central region of the State of Veracruz (Necaxa to Cordoba) (Baker 1930).

SUMMARY OF DISTRIBUTION RECORDS

The terrestrial molluscs reported from Mexico consist of 1,178 species and subspecies in 42 families. The 236 species in 34 medium and small families represent 81% of a total of 42 families found there. The diversity of the lesser families ranges from one species in Cochlicopidae, Megomphicidae, Arionidae, and Sagdidae to 23 species in Cyclophoridae and 24 in Succineidae.

General patterns of the distribution of the lesser families of terrestrial molluscs in Mexico are shown (Table 2). To the north-western side of the country (Fig. 3) are the families Megomphicidae, Arionidae, Haplotrematidae (in part, 1 record in the east), Vallonidae, Helminthoglyptidae, and Oreohelicidae. The Cochlicopidae is localized in the north-center (Fig. 3) of Mexico; the Discidae is concentrated in the north-east center. The Carychiidae, Ceresidae (in part, 2 species in the west), Veronicellidae (in part, 1 record in the west, and 1 record in the south), Diplommatinidae, Systrophiiidae, Sagdidae are observed mainly in the eastern side (Fig. 2). The Charopidae are established in central Mexico. The Philomycidae are patchily distributed but fairly widespread. The families Annulariidae, Amphibulimidae, and Megalomastomidae are localized towards the southern side (Fig. 1). The Achatinellidae are

Table 2. General geographic distribution of some taxa occurring in Mexico.

Palaearctic	Holarctic	South American	Nearctic (North America)	Worldwide distribution	Other
<i>Strobilops</i> possibly its origin is in Asia	<i>Discus</i>	Charopidae	Haplotrematidae	Strobilopsidae	Annulariidae Antilles, Central America, South America
Carychiidae	<i>Punctum</i>	Systrophiiidae	Helminthoglyptidae	Zonitidae	Cyclophoridae same data as above plus other places
Cochlicopidae	<i>Hawaiiia</i>	Veronicellidae	Oreohelicidae	Philomycidae	Achatinellidae Pacific Islands
	Arionidae	Ceresidae	Megomphicidae	Truncatellidae	Megalomastomidae American
	Euconulidae		Middle America Thysanophoridae	Diplommatinidae	
	Vallonidae			Ellobiidae Ferussaciidae Succineidae	

representative of the Pacific islands. The families Ellobiidae and Truncatellidae are dwellers of the intertidal zone of both coasts. In addition, the families Cyclophoridae, Helicodiscidae, Punctidae (more toward the north), Thysanophoridae, Succinidae, Euconulidae, Ferussaciidae, Subulinidae, Vitrinidae (*Hawaii*), Gastrodontidae, Strobilopsidae, and Zonitidae are of wide distribution in the country (Figs. 4-6).

The distributions of the diverse genera appear to be related to the most humid, sub-humid, and semiarid areas of Mexico. The Diplommatinidae, Ceresidae, Vitrinidae, Euconulidae, Helicodiscidae, Succinidae, and Thysanophoridae occur in tropical and subtropical environments, while the Annulariidae, Megalomastomidae, and Amphibulimidae are mostly tropical.

The Veronicellidae (Naranjo-García *et al.* 2007), Charopidae (Miquel *et al.* 2004), Amphibulimidae (Thiele 1935), along with the Systrophiiidae are much better represented in South America. Typical American continent families are Megalomastomidae, Sagdidae, and the genus *Thysanophora*.

In Table 3, interestingly, the number of species Mexico shares with the United States (51) and with Central America (54) is about the same, and the taxa shared among the three areas include 14 species. Thus, it would appear that 146 species are endemic to Mexico and 90 are also found elsewhere. It must be kept in mind, however, that many areas of Mexico and adjacent regions are under-collected.

CONCLUSIONS

Distribution patterns are suggestive but are somewhat preliminary because extensive areas of Mexico have not been studied for land molluscs. Under-collected areas are the States of Nayarit, Sinaloa, Tlaxcala, Guanajuato, Durango, Coahuila, Aguascalientes, Guerrero, Zacatecas, and parts of the State of Chihuahua.

Regarding micromolluscs, Solem's (1976: 2) statement continues to be valid around the world: "The species are very small (96.4 % are <7 mm in maximum size), secretive inhabitants of litter or may be found on moss-covered tree trunks in tropical and undisturbed forests. They are found only by the most skilled collectors". Some species have limited data information, others are known from very few records, and some from only a single locality.

The apparently eastern distribution of most families is a consequence of the extensive collecting by explorers of the late nineteenth and early twentieth centuries whose travels were on the east side of the country (Naranjo-García and Polaco 1997).

Studies of the distribution of native species, including terrestrial molluscs, are of utmost importance because of the

Table 3. Mexican (MX) families with number of species shared with the United States (USA) and Central America (CA).

Family	United States	Central America	Shared USA/MX/CA
Amphibulimidae		1	
Annulariidae		1	
Carychiidae	2	1	1
Charopidae		1	
Cochlicopidae	1		
Cyclophoridae		4	
Diplommatinidae		1	
Discidae	1		
Ellobiidae	3	4	
Euconulidae	3	6	1
Ferussaciidae		2	
Gastrodontidae	3	2	2
Haplotrematidae	2		
Helicodiscidae	3	3	1
Helminthoglyptidae	4		
Megomphicidae	1		
Megalomastomidae		3	
Oreohelicidae	1		
Philomycidae	1		
Punctidae	4		
Sagdidae		1	
Strobilopsidae	2		
Subulinidae	3	8	4
Succinidae	8	1	
Systrophiiidae		3	
Thysanophoridae	2	7	2
Truncatellidae	1	3	
Valloniidae	2		
Veronicellidae	1	2	1
Vitrinidae	1	1	1
Zonitidae	2	1	1
Total species and subspecies	51	54	14

many threats to their existence. Habitat is destroyed by urban development, land and stream pollution, and cutting of native forests. Many type localities have disappeared due to habitat destruction. Habitat changes in both developed and underexplored areas may lead to the extinction of entire species. The introduction of non-native species presents the potential for competition with native species, which can and does lead to their extinction. Without adequate records, it is impossible to evaluate the magnitude and effect of such changes. The future of biological life will be controlled by governmental decisions. The study of terrestrial molluscs and other living things is essential if we are to influence those governmental decisions.

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